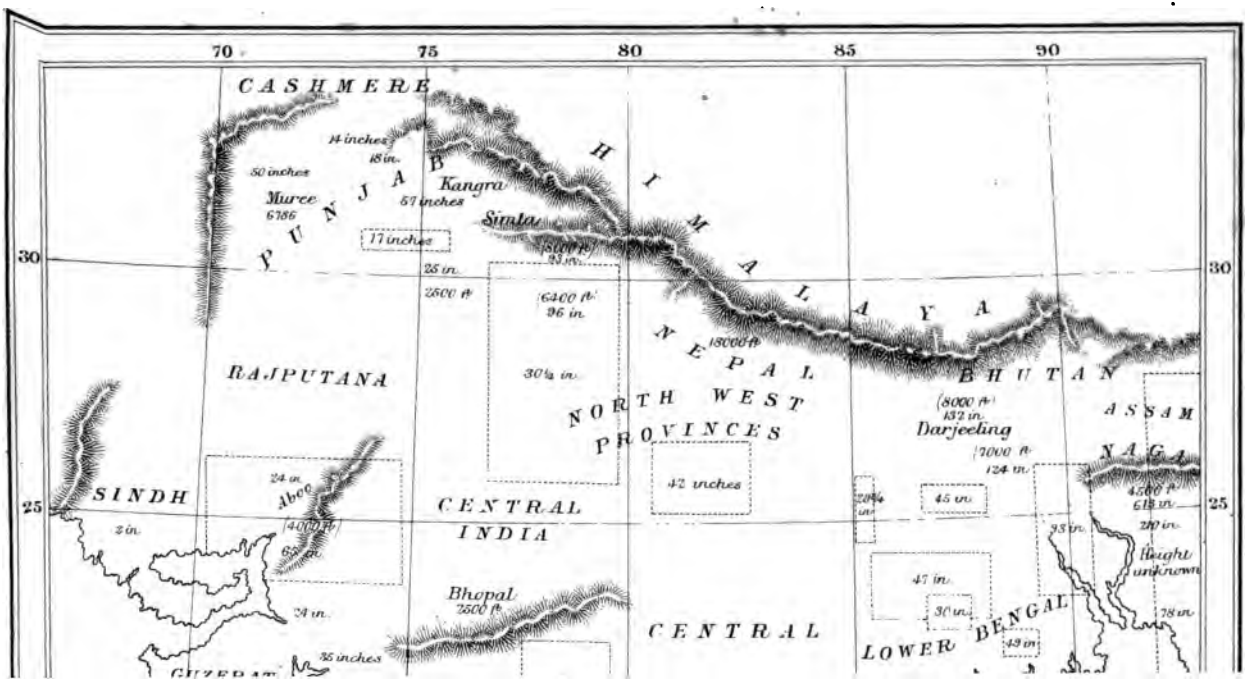
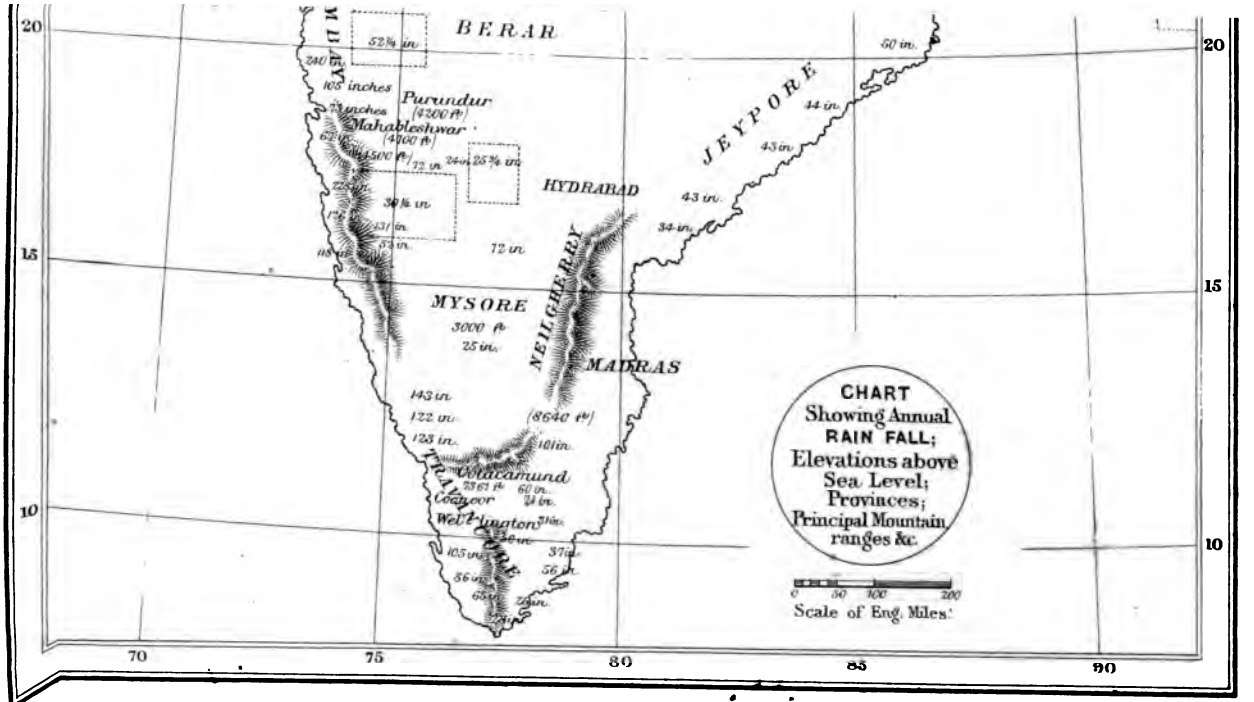
THE ELEMENTS OF

INDIAN HYGIENE

INDIAN HYGIENE

NON EST VIVERE, SED VALERE VITA.


70
75
80
85
90
30
25
CASHMERE
PUNJAB
HIMALAYA
Murree
6786
Kangra
Simla
7000 ft
RAJPUTANA
NEPAL
BHUTAN
NORTH WEST
PROVINCES
Darjeeling
7000 ft
ASSAM
NAGA
SINDH
Aboo
4000 ft
CENTRAL
INDIA
Bhopal
2500 ft
CENTRAL
LOWER BENGAL
GUZERAT
50 inches
14 inches
18 in.
57 inches
17 inches
25 in.
2500 ft
6400 ft
36 in.
18000 ft
30½ in.
33 in.
(8000 ft)
132 in.
124 in.
42 inches
24 in.
2 in.
65 in.
24 in.
35 inches
45 in.
33 in.
47 in.
30 in.
49 in.
78 in.
4200 ft
613 in.
210 in.
Height
unknown


BERAR
MYSORE
3000 ft
25 in.
HYDRABAD
JEYPORE
MADRAS
NEILGHERRY
Purundur
(4200 ft)
Mahableshwar
(4700 ft)
(4500 ft)
72 in.
24 in.
25¾ in.
52¾ in.
240
105 inches
72 inches
62 in.
30½ in.
131 in.
63 in.
118 in.
72 in.
50 in.
44 in.
43 in.
43 in.
34 in.
143 in.
122 in.
123 in.
(8640 ft)
101 in.
Calicamund
7361 ft
60 in.
Coonoor
74 in.
Wellington
37 in.
105 in.
37 in.
86 in.
56 in.
65 in.
26 in.
CHART
Showing Annual
RAIN FALL;
Elevations above
Sea Level;
Provinces;
Principal Mountain
ranges &c.
0 50 100 200
Scale of Eng. Miles.
20
15
10
70
75
80
85
90

THE ELEMENTS

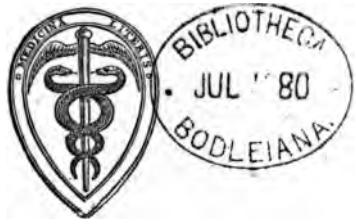
OF

INDIAN HYGIENE

BY

JOHN C. LUCAS, F.R.C.S., Etc.

HER MAJESTY'S INDIAN MEDICAL SERVICE



LONDON

J. & A. CHURCHILL, NEW BURLINGTON STREET

1880

TO

Those of his Medical Brethren,

AND TO OTHERS, WHO HAVE STUDIED, INVESTIGATED,

AND LABOURED TO IMPROVE

THE SANITARY SURROUNDINGS OF THE POOR OF INDIA,

THIS SMALL TREATISE

IS RESPECTFULLY DEDICATED BY THEIR ADMIRER,

THE AUTHOR.

"There is a history in all men's lives
Figuring the nature of the times deceased;
The which observed, a man may prophesy,
With a near aim, of the main chance of things
As yet not come to life; which in their seeds
And weak beginnings lie intreasured."

[SHAKESPEARE.]

PREFACE.

THE daily increasing interest now taken in sanitary matters by all the enlightened classes of the community in the country teems with the promise that Preventive Medicine in India has a bright future. This has been a no small *primum mobile* in offering the following pages to the public, with the view of assisting and guiding them in acquiring some knowledge in the all-important subject of preservation of health, and the prevention of sickness, in order to enable individuals to be not only their own custodians of health, so to speak, in a measure, but also, through them, to throw some light on those in humbler spheres of life, on whom

the light of the different sciences can only fall through a more or less circuitous and refracted channel. It is to be hoped, however, that this beaten track will be smoothed, shortened, and straightened, and that the condensed contents of this work may prove of some service to those who are busily engaged in their respective avocations, which leave them but little leisure, especially in a clime unfavourable for intellectual labour, to consult larger treatises, or who have few opportunities for the perusal of these, or of special monographs, reports, etc.—dealing with abstract topics—which from time to time appear in print.

The author desires to point out that, whilst it has been his solicitude not to omit to assign some little space to the consideration, from this stand-point, of snake-bite and hydrophobia, and of the hygiene of children, he has deemed it desirable (for obvious reasons)

to leave out, *in toto*, the subject of venereal diseases, a chapter on which, and on the favourable influences of the married state over celibacy, had been written, but which is not placed in the hands of the celebrated publishers to whose care the execution of the work has been entrusted.

It now remains for him to invite aid to chronicle deficiencies or suggestions, with the promise that he will not fail to incorporate, in any future editions which the work may undergo, all well-weighed emendations intended to keep pace with the sanitary advances of the day, and for this benevolence he begs to add that he shall feel inexpressibly grateful to his commentators.

December, 1879.

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INDIAN HYGIENE

CHAPTER I.

INTRODUCTION.

Definition.—The term, *Sanitation*, implies the measures which in all civilized countries are put in practice with the view of promoting public health, of preventing sickness, and, thereby, of prolonging life; or, in other words, of diminishing mortality, and favouring longevity.

Causes of Sickness.—Defects in water, air, soil, food, and clothing are amongst the principal factors which tend to the causation of disease, shortening of life, and the diminution of population. It is the aim of this branch of medical science to correct faultiness when it exists in one or other of the natural conditions with which mankind, in common with

the lower animals, is surrounded. These physical environments are essential and necessary to life and the various functions by which it is sustained. These functions should be carried on in as perfect and harmonious a manner as possible, and thus for as long a time as possible, in order that the sustentation which they tend to afford to the vital machinery may enable it to continue its work for as long a period as is compatible with the laws of life. All civilized countries have laws, more or less perfect, which are made with the object of removing such of the conditions from amidst the population as are certain or likely to cause disease, or in any way prove hurtful. In some countries these laws—the aim of which is not only to regulate internal matters pertaining to health, but also to prevent the importation and spread of disease from other countries—are very many, and directed to manifold and endless objects. And, as all this advances in other countries, and notably in the United Kingdom, India is not remaining, and will not remain, in the background, but she also advances, and enjoys, *pari passu*, the benefits of

one of the most valuable gifts of civilization, bestowed on her by England.

Climate: and the Causes which Influence it. —The meteorology of every country no doubt plays a very important part in bringing about those conditions which directly or indirectly affect the health of its inhabitants. For example, the effects of the combined influences of the air, water, soil, and extent of solar energy of one place vary greatly from those of another; and so, accordingly, the diseases of one country, or even of a part of a country, are less commonly met with in another, and *vice versâ*.

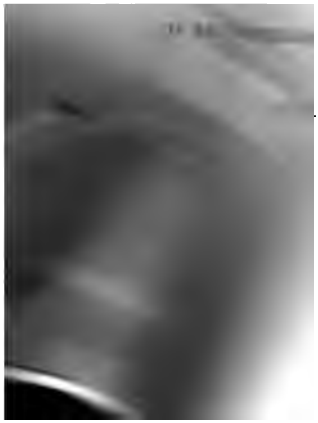
Our aim here is to show briefly that many of the climatic influences are brought about by the inhabitants themselves; who, whilst they are able to render climate worse than it may have been the same time capable of choosing, same land, between a bad climate good one; and, indeed, between health ase —life and death. With the exc ew of the hereditary ills which ar climate—and they, too, are th time—all, or nearly all, are in

of the people themselves. For instance, the heat or temperature of the air, its dryness, the heat or temperature of the ground, its dryness, can all be modified by man.

By draining a land, so as to allow the rain-water to flow away in properly-regulated streams, we can make both the earth and atmosphere of the place dry—this would have a direct important effect on health—whilst, on the other hand, if there were no drainage, by canals, etc., to carry off this monsoon rain, the chances are that the tract of country would be inundated and water-logged. Fever would, therefore, be rife at the time, and long afterwards—which would be its direct evil effects—whilst, indirectly, all this water, which might be, and surely is, useful during the dry season, will be wasted if not in some way collected and stored; and the result will be, as has been, what India has repeatedly experienced in the shape of famine. Where there are bodies of water, we find there also ample verdure; and where there is verdure, there is also certain to be water near by, either on the surface of the ground, or at a small depth under it. This

brings us at once to a subject on which there has been a diversity of opinions recently expressed in this country and elsewhere.

Influence of Forest on Rainfall.—That the presence of vegetation renders the air of a locality cooler, is as unequivocally beyond all dispute as that it mechanically impedes its movement. The solar rays of places where there are forests are obstructed, absorbed, and thus minimized; and also for the reason that the air receives moisture from the trees, etc., the evaporation from which is known to be great. The ground, then, on which there is vegetation will be moister and cooler than the ground devoid of it. Vegetation also exercises very important influences on the chemical composition, temperature, etc., of both the sub-soil or ground air, and water. The air of the sub-soil is lowered in temperature, and, therefore, is of greater specific gravity, which, *per se*, has an instant effect on the height at which the ground-water stands. Here we have, to start with, one great factor against the process of evaporation of what water there may be underground; in the next place, the roots of trees must, both mechani-



explicitly testified by tabulated observations of river-levels in various countries."

Another writer, Mr. Marsh, in his excellent treatise, "The Earth modified by Human Action," recently published, speaks much to the same effect:—"As the forests are destroyed, the springs which flowed from the woods, and, consequently, the greater water-courses fed by them, diminish both in number and volume."

Rain.—We are all of one and the same opinion as to the cause of rain, which is lowering of the temperature of warm air containing a certain quantity of moisture or humidity—the warmer the air, the more can it be saturated with moisture—and this takes place when the hot air, laden with oceanic moisture, comes suddenly in contact with air of lower temperature, but higher than the freezing-point; the former then cannot retain so much of its aqueous vapour, which forthwith liquefies, and thus this watery vapour, by its liberation, goes to form rain.

Now, it may be said that if there were no forests, or if they were comparatively limited in extent and number, to cool the

air of the country, the heavy moisture-containing clouds, brought periodically into India athwart the Indian Ocean by, what are called, the *trade-winds*, would still — despite the absence of forests in the country—continue to be brought; but, in this case, these clouds, owing to the unfavourable conditions for the formation of rain, are not likely to prove of natural utility to the country. They pass onward with the direction of the strong wind. That this identical result is produced in other countries, such as Spain, Greece, Sicily, Canary Islands, Arabia, Persia, Palestine, and even in certain parts of India itself, as Scinde, is a well-known fact. And, moreover, in other parts of India, where, prior to the denudation—indeed, reckless denudation —of trees, etc., there had always been heavy rainfall, the reverse has been the rule, or perhaps a certainty, since the diminution of their forests. These phenomena, which are based upon ascertained physical and chemical laws, have been verified by actual experience.

A Swiss philosopher avers that "A warm and moist wind, the south-west of the Atlantic, for example, setting from the tropics,

comes in contact with the colder air of the temperate regions; its temperature is lowered; it can no longer contain as great a quantity of vapour. A portion of its humidity is immediately condensed into clouds, then falls in rain.

"Or the opposite: a wind charged with clouds arrives in a warmer and dryer air, comes, for example, from the Mediterranean to the Sahara, as is the case during three-fourths of the year; the burning air of the desert having a much greater capacity for vapour dissipates instantly all the clouds, which break up, vanish, and disappoint the excited expectations of the traveller, who hoped for refreshing rain.

"Do the moist winds encounter an elevated obstacle, a high chain of mountains, a plateau? Forced to ascend their slopes, high into the atmosphere, they find there a colder air, which condenses their vapours, and the rain flows along the sides. The wind passes over to the other side of the chain; it arrives dry and cold, deprived of all its moisture, without clouds. The same wind thus brings rain on one side, and fair

weather on the other. This is what happens every day on the two sides of the Scandinavian Mountains.

"It is possible that an ascending current, if very violent, may hurry the abundant vapours of the lower layers to the more elevated layers of the atmosphere. The vapours are afterwards condensed there, and fall back in torrents of rain. Such, at least is the explanation which Humboldt gives of the rains of the tropics."*

From what has been mentioned in the foregoing lines, the reader will, without much mental exertion, be able to make his own deductions. The inference on his mind must undoubtedly be that forests on large scales do bear an important influence upon the extent of rainfall. Practically, it may be said that meteorological, topographical, and other observations have been found to lend their support, in the main, to the principles above roughly enunciated, namely, that by

* "The Earth and Man." By Arnold Guyot, Professor of Geography and History, at Neuchatel, Switzerland. Translated from the French by C. C. Fenton, Professor in Harvard University. London, 1857. Richard Bentley.

forestry we can very materially bring about a larger rainfall, and thus prevent drought and scarcity. The subject, it may be said, has been carefully studied in Germany, and much of our precise knowledge has been acquired from that direction.

"By earthly nature had the effect been wrought
Upon the dark materials of the storm
Now pacified; on them, and on the coves
And mountain-steeps and summits, whereunto
The vapours had receded—taking there
Their station under a cerulean sky."

[WORDSWORTH.]

CHAPTER II.

WATER.

If in any country the purity of water, adequate to its requirements, is an absolute necessity, it is in India. The reason of this is apparent when we come to consider for a moment the climate, the habits, the customs of the various races inhabiting the country, and, what is of not less importance, the constant migration of people from place to place, besides other circumstances too numerous to notice here.

(A.) *Sources of Water-supply in India.*—The ordinary sources of water-supply are—(1) the great rivers, with their branches; (2) lakes, natural and artificial; (3) wells; (4) tanks; and (5) springs, etc.—the annual rainfall aiding all these materially.

(B.) *Causes of Contamination in Source: and Suggestions.*—Water in its source is not unfre-

quently rendered unwholesome by the presence therein :—(1) of mineral impurities, which are dependent upon the geological constituents of the soil, with which water comes in contact, and takes up either in a suspended or dissolved state; (2) of vegetable impurities when there is much rank or putrid vegetation in the vicinity of the source; (3) in the neighbourhood of towns, villages, and thoroughfares, water is liable to contamination with human and animal excreta. If, then, the soil be not impregnated with hurtful mineral and other substances, if there be no decomposing plants, etc., in or near the source, and sewage, etc., be prevented from entering it or the earth close to it, the water so derived is of excellent quality. It must be borne in mind, that in Indian towns and villages, which generally are over-populated, the small rivulets, wells, superficial springs, etc., are always suspicious sources of supply, as it is impossible to ensure them from the effects of soakage and overflows. The most constant supervision is essential, so as to be able to detect and remove any possible causes of contamination when they exist.

(C.) *Storage: and Protection of Drinking-water.*—It is a matter of the greatest importance, both to the public and to the State, that there should always be a sufficiency of water, of good quality, stored up for the requirements of the dry seasons. All nuisances are to be sought after, and removed when detected to exist, at or near the source; and, in the case of wells, the ground surrounding them should be paved, and even, when possible, cemented, and thus rendered filth-tight. It is also an excellent plan to cover in and flag them. Saucer drains should be constructed to carry off the waste water. The public should be prohibited from bathing, or washing clothes, etc., or cattle, near wells; and it would also be a sanitary safeguard if metallic vessels, suspended with a chain, were provided, and people strictly prevented from dipping their own vessels and ropes when drawing water from public wells.

(D.) *Contamination during Transit.*—The water, if not originally impure, is apt to get so in its transit in *massacks* (leathern bags), carts, etc., to the cleanliness of which and of

other media of conveyance, attention should constantly be directed.

(E.) *Simple Methods of Recognizing Pure Water.*—(1) Wholesome water should be colourless, clear, and transparent. In order to test this with tolerable accuracy, it is necessary to pour the water under examination into a clean, tall, transparent glass jar, and to look lengthways and sideways through the water at a piece of white paper with small marks or dots upon it; if these can be distinctly seen through a height of eighteen inches or thereabouts the water may be pronounced, with a tolerable amount of certainty, to be free from suspended matters. In this way even slight shades of colour or tinge, or the presence of water-fleas, etc., can be discriminated. (2) Pure water is properly aërated, cool, and (3) without taste or (4) smell. (5) The question between soft and hard water (the latter called so from the presence in it of carbonate of lime) is not a very important one; the former, where it can be obtained, is of course to be preferred for drinking purposes.

(F.) *Modes of Purifying Water.*—We have now to point out some simple means of purifying water.—(1) *Filtration.*—There are several ways of filtering water, and thereby mechanically getting rid of impurities. In sandy soils the water is filtered naturally. Artificially the process is imitated by the manufacture of various kinds of sand and other filters; and in the case of the Presidency, and other large towns, this is, or may be, done at or near the source, prior to conveyance and distribution by means of pipes. We will not here enter into a description of the different sorts* of filters in use; suffice it to say that in this country the ordinary three-*chattie* filter is good enough, economical, and easily replaceable, if only carefully looked after. The uppermost *chattie* should contain finely-pounded (animal) charcoal enough to occupy a quarter or a third of its capacity, over which there may be placed large pieces; the lowermost *chattie* being the receptacle after filtration. If water of yellowish or brownish tinge, show-

* Dr. MacNamara's filter, as in use by the British troops in barracks and hospitals in India, is excellent.

ing impregnation with animal or vegetable substances, be made to pass through animal charcoal, the effect is marked. Before concluding the subject of filtration we have to observe that all filters need careful looking after, and even to be renewed from time to time. The mere fact of water having passed through a filter (?) is no guarantee of its having been filtered. (2) *Boiling.*—Water—at least, that of which the nature is unknown or doubtful—should in every case be boiled, by which means we also get rid of certain inorganic substances, as lime, etc., which are believed to cause urinary calculi, or stones, and the disease known as goître; in other words, we can by boiling remove hardness. (3) *Alum.*—This is an excellent agent at our command for purification, which it effects by sinking suspended matters. The following substances are of chemical advantage in removing any offensive smell which there may be, or for destroying and rendering inert the poisonous seeds of certain (contagious) diseases, as cholera, typhoid or enteric fever, dysentery, etc. etc. :—The sulphate or other prepara-

tions of iron, the permanganate of potash, etc.

(G.) *Bathing.*—The functions of the skin are dependent upon its cleanliness: bathing, therefore, is conducive to health. Many diseases of the skin, such as itch, ringworm, etc., are owing to uncleanly habits.

The only kinds of bath which it is our intention to notice are those which ordinarily form part and parcel of advanced domestic arrangements. Space, however, will oblige us to limit our remarks; but it is trusted that what we shall endeavour to embrace—although in an imperfect and general sketch—will be found practically useful for the purpose of rendering the act of bathing an important means for the preservation of health; this salutary result, indeed, proceeding not alone from the cleansing of the surface of the body, but also from the remoter physical and chemical actions induced by bathing.

(1) The *cold bath*, at temperatures between 60° and 75° Fahrenheit, if used for a short time, gives tone, acts as a general stimulant and astringent to the system, and on reaction produces warmth. Its employment is

a valuable, though costless, means at everybody's disposal for the prevention of diseases, especially those which result from want of tone of the tissues. In the hot months it would prevent any tendency there might be to rise of temperature of the body—in a word, it may be called a *prophylactic* against sun-stroke. But owing to the effect, *cæteris paribus*, the cold bath has in the instantaneous retrocession of blood from the skin and muscles to the internal organs, it should be resorted to with caution, and under medical advice, by those in whom the latter are deranged. This untoward effect will vary according to the temperature of the water, and the duration of the immersion.

(2) In the *shower bath* the effects are similar in kind, but differ only in degree in direct proportion to the lowness of the temperature of the water, the height from which it is poured, and its quantity. In the case of persons with a tendency to simple headache, and sleeplessness at night, it is certain to prove beneficial; at all events it is worth trying, inasmuch as the refrigerating effect is not only on the head direct but is applied to that part first.

(3) With reference to *sea bathing* we may observe, *en passant*, that all the bracing, stimulating, and tonic effects of the *cold bath* are greatly enhanced; for, in addition to the advantages of temperature, *sea bathing*—from the fact of the water containing certain salts valuable to the animal economy and which are absorbed, and for the reason that a certain amount of exercise can always be taken by those who can swim, while even those who cannot swim may also move about their limbs without going to depths—ought to recommend itself to the inhabitants of sea-port towns.

(4) We next treat of the *warm bath* as ordinarily employed with plain water, at temperatures from 90° to 100°. The sensations and effects on the system are the converse of those produced by the cold bath. Conversely to the latter, it causes a gratifying feeling of animation, soothing the entire nervous system, and relieving slighter degrees of spasm, pain, and other irritation when present. The effects, of course, vary with the temperature, the particular constitution, the state of health, and the season of the year;

and on the whole, the warm bath relaxes the system generally.

After great muscular exertion, the body, if previously heated, should first be allowed to cool, and then the beneficial effects of the warm bath will manifest themselves. In irritable subjects of delicate habits, and still more in persons suffering from chronic diseases, particularly when of an inflammatory character, the warm bath will be found both agreeable and invaluable. In the different sorts of sedentariness, as of the mental labours of study; or with bodily activity and exertion, as in many of the departments of professional and public career; and last, but not least, in the epicurean and fashionable avocations of dissipation, the warm bath will often prevent ill-health.

(5) Many persons like bathing in water with just the "chill taken off," as they call it; which means *tepid*, at a temperature between 80° and 90°. We are not prepared to say that this can be expected to have any good effect beyond the object of ablution. As compared with the warm bath, it is decidedly less exhilarating, less pleasant, and even less

soothing; in short, it neither possesses the direct *stimulus* of the warm bath, nor the indirect *stimulus* of the cold. Compared with the latter it is, in our opinion, certainly more prone to cause an uncomfortable, chilly sensation.

One word before we conclude this subject, and that is, in those places where there is suspicion of the water containing parasitic forms, especially the Guinea worm, it is advisable that the water used for purposes of ablution and bathing should first be boiled.

CHAPTER III.

AIR.

THE purity of the air we inhale, like that of the water we drink, is altogether indispensable. The oxygenation of blood is so much dependent upon the purity of the breathing air, that if from any cause whatsoever the latter is vitiated, it cannot but render the former abnormal, and, so, more remotely to tell upon the health of the individual in a variety of ways.

(A.) *Impurities in the Air.*—The reader will perceive how easy it is for the air, like water, to take up impurities. (1) The air of ill-ventilated habitations, occupied even by healthy persons, is vitiated by an excess of the products of respiration, the impurity being caused by there not being proper ventilation for the entrance of fresh air and the exit of foul. The atmosphere of rooms, in order

to be sufficiently pure, must be frequently renewed from outside. (2) Although there may be sufficient means for ventilation by doors, windows, etc., the rooms (especially dormitories), may be overcrowded, and thus the air would not be often changed. (3) The atmosphere may become impure from the products of combustion, as of cooking, of certain trades or industries, etc. (4) By effluvia from urinary or bowel excreta. (5) From uncleanliness of the walls, floor, etc., of the house or hut; or, of persons, clothes, etc.; as also from the products of respiration and effluvia from excreta of cattle, etc., when lodged in sleeping rooms, etc. These are, briefly, the defects which frequently exist within dwellings of towns and villages.

We will now proceed to the consideration of the manner in which the impurities may arise outside, and be conveyed to dwellings by the surrounding atmosphere. (6) The wind takes up in its course substances from the soil—inorganic, as lime, carbon, etc., or organic, as *débris* of vegetable or animal substances, spores of fungi, or the germs of disease—for the transmission of all of which air is a

common vehicle. (7) If there be much moisture near around houses, huts, etc., from bodies of water such as tanks, wells, etc., the air is liable to take up an undue proportion of it, which will affect the health of the inhabitants, and cause catarrhal and rheumatic affections. (8) The effects of breathing marshy air are too well known as fruitful in the causation of paroxysmal fevers, etc.

(B.) *Simple Methods of Purifying Air.*—As defects are detected in each of the conditions enumerated in the foregoing lines, they must be rectified to the utmost practicable extent. A few brief remarks may, however, be admissible under each of the headings. (1) The correction of defective ventilation is effected by the adoption of means for the freest ventilation possible. This is done by the construction of doors, windows, ventilators, and other apertures (for the entrance and exit of air), which are to be left open, and not closed or stuffed up with straw, etc., as is not unfrequently the case in the huts of the middle and poorer classes. This is the first and foremost of principles for the purification of the air of habitations, and ought never, there-

fore, to be lost sight of. (2) Over-crowding should be avoided. It is far better for poor people to sleep out in the open at night, provided it be not wet, than for a number to lie alongside one another in small rooms. (3) We believe, however, that there is nothing more common or worse, even in tolerably well-to-do native dwellings, than inattention to the means of ventilation and outlets for the free escape of smoke, etc., of culinary combustion. (4) Excreta should not, if avoidable, be allowed to remain in or near rooms used for sleeping or cooking. (5) Personal and other cleanliness must be observed; and cattle, etc., ought, where possible, to be housed away from sleeping rooms. (6) The surface of ground surrounding houses, huts, etc., should be frequently swept, and so kept clean and free from nuisances. This applies equally to public streets, roads, tracks, or thoroughfares, as well as to private premises; the sanitary condition of the latter is almost of as much concern to the neighbours as to their immediate occupants. The importance of this counsel must always be borne in mind. Mud, dirt, house-refuse of all sorts, with

human and animal excreta, are so apt, in the rains by surface washings, and in dry weather by the medium of the air, to pollute both the breathing-air and drinking-water, that the subject demands the most earnest attention. These remarks are applicable with much greater force to thickly populated villages and towns, where the lanes or paths leading to them, or separating one house or hut from another, are sometimes, or rather we should say generally, not wide enough, and so interfere with the free movement and circulation of atmospheric air. (7) All holes or gaps in the ground, where water is likely to collect in the rains, and in consequence of which herbage quickly sprouts up, ought to be filled up, at least over the surface, with earth. (8) Should there be much jungle or other vegetation around houses, huts, etc., it should be cleared away, as besides its giving off the particular poison which causes ague, hedges, trees, etc., are likely to act as impediments to the onward and outward passage, respectively, of fresh and impure air.

CHAPTER IV.

SOIL.

We now come to the subject of soil, as appertains in a sanitary point of view.

(A.) *Consistence.* — The reader probably knows that the soil is made up of constituents from the mineral, vegetable, and, sometimes, from the animal kingdom, the interspaces between these being occupied by air, and, frequently, by water. This being so, it is not difficult to understand that the soil, so composed, is capable of exerting, both directly and indirectly, an important influence over health.

(B.) *Sanitary Impurities arising from Soil.* —We will now devote some little time to the brief discussion of these *seriatim.* (1) The mineral portion, according to its nature and proportion to other ingredients, can affect, for good or for bad, the composition of

sub-soil or ground-water, which, in its turn, finds its way to the different sources of water-supply. Besides this, it is likely to exercise a hurtful power in other ways. (2) Then, again, the amount of vegetable matter which the soil contains is capable of decomposition by the action of the heat and light of the sun, assisted by sub-soil moisture. In this manner, both the drinking-water and atmospheric air of the site are subject to alteration. (3) Moisture in the soil to any great extent renders damp the atmosphere of the locality, and, consequently, the houses, huts, etc., built thereon; and so catarrhal and rheumatic affections are rife in moist climes. (4) The effect of certain temperatures on the combined conditions of excessive moisture and vegetable matter, is the production of the poison causing ague, etc. (5) In like manner, moisture and heat being also important and essential elements in the process of decomposition of animal matters, it is with logic to say that these, when co-existent on the surface of, or in the interior of, moist soils, would render impure both the breathing-air and drinking-water; and thus certain diseases,

as dyspepsia, diarrhœa, dysentery, diphtheria, etc., are engendered. (6) The soil may be polluted by sewage in one of two ways—either by primary soakage into the earth of discharges deposited in the ground, or by secondary saturation from surface washings, from rivers, etc. The water of rivers and their branches, when near towns and villages, as a general rule, contains fæcal matter, which easily finds entrance, by percolation through the adjacent soil, into neighbouring tanks, wells, etc.

(C.) *Remedial Measures for Defects arising from Soil.*—(1) The mineral matters in the soil are not of much consequence. The water, if impregnated with these, should be purified after the manner recommended when dealing with the subject of water. (2) The removal of moisture from the soil is an important portion of the duties of the sanitary engineer. Paroxysmal fevers, etc., occur more especially in places where there is little or no superficial and deep drainage. Indications, therefore, for the correction or mitigation of defects arising from this cause, when there is, as is often the case, some

obstruction to the onflow of water (either from natural or artificial causes, as of hills, level or slope in the ground, etc., or construction of buildings, roads, etc., respectively), are obvious. Even in the case of small towns or villages, there should be some attempts at elementary drainage to carry away, at least, the rain-water. In the case of towns more advanced, and where funds permit of it, the system of drainage may not only be of improved principle, but it may be extended for the removal and disposal of refuse-water; next to that, of ground-water; and, finally, of sewage. (3) As sewage is liable to permeate the earth, it is evident that night-soil should be removed and disposed of at as great a distance as possible from dwellings, thoroughfares, etc. Allusion to this has already been made, so that there is no necessity for further comment than to point out the fact, that a good system of drainage is of actual subservience in the purification of water, air, and soil. The utilization of sewage for agricultural purposes is a matter which deserves greater attention than has been paid to it. (4) The climate

of a place, and consequently its public health, being so much influenced by the presence or absence of forests, a few words on the subject will again find a fitting place here. The presence of forest renders the temperature of the locality lower, and by increasing the rainfall makes both the air and soil moister, not only on account of more rain, but also because the roots of trees impede the flow of sub-soil or ground-water. (5) In malarious districts it is evident that trees would act as obstacles to the movement of air containing malaria, which, for this reason, would be present in a concentrated form; and that by clearing away some of the trees, the movement of the atmospheric air would be facilitated, the resulting dilution with purer air diminishing its malariousness. These are considerations of immense moment, and, *per se*, demand the earnest attention of the members of the Forest Department. (6) For towns and villages on banks of rivers, which are notorious for being both damp and feverish, the indications for rendering them salubrious are the removal of obstructions to the onflow of ground-water to

the rivers; and if there are large trees, the roots of which are likely to impede the land drainage, or shallow banks, etc., it is clear that by removing the trees, by raising the embankment, and by deepening the banks, with other like measures, we can alter the sanitary conditions, and thus make these places much healthier.

(D.) *Disposal of the Dead.*—As in India, more than in any other country, customs and religious superstitions are likely to clash with sanitary principles, it will not be amiss to consider some of the points more immediately connected with the disposal of human remains. The subject is of vast importance to the public in general. As a fitting introduction to it we cannot do better than quote the words of the late Professor Parkes, who wrote definitely on this vital question:—

"In reality, neither affection nor religion can be outraged by any manner of disposal of the dead, which is done with proper solemnity and respect to the earthly dwelling-place of our friends.

"The question should be placed entirely on sanitary grounds, and we then shall judge it rightly.

"What, then, is the best plan of disposing of the dead, so that the living may not suffer?" *

(i.) *Modes of Disposal.*—The following are the plans in vogue in this country:—(1) Burial in land; (2) cremation; (3) burial in water (sea or river); (4) in towers of silence; (5) embalming, with temporary burial in land, subsequent removal, and reinterment. The disposal of dead bodies must be done away from cities, towns, and villages. In the case of cemeteries, whenever there is a choice, preference should invariably be given to dry soil, and, when permissible, they should be provided with drainage, care being taken that the course given to the water is not in the direction of any of the sources of water-supply.

(ii.) Graves should be dug deep, to allow of the greatest filtration, both of gases and water. If they can be constructed air-tight, all the better. Trees and quickly growing shrubs should be planted in all graveyards, cremation-grounds, towers of silence, etc., to absorb gases and fluids. Re-interments should not be permitted at short intervals. In the

* "Practical Hygiene," 4th ed., p. 449.

case of minor towns and villages, the question may be asked by the inhabitants—"At what distance from our homes should we bury our deceased relatives and friends?" To this we would answer that it is not advisable, for their own sake, to do it nearer than a hundred and fifty yards; in fact, the farther away the better.

(iii.) *Sanitary Considerations.*—Burial at sea is certainly, and without doubt, the most sanitary plan of disposing of dead bodies. Care should, however, be taken to make sure that they are not washed back to shore. Sea burial ought, therefore, to recommend itself to all sea-port towns and villages. Cremation should, on sanitary grounds, be preferred to land burial, but not to sea burial. In cremation, or burning of the body, the process of disintegration is rapid and complete, and there is very little danger of contamination of water or air. Burial in land is decidedly objectionable, as by it both air and water take up hurtful impurities. The Parsee plan of disposal in towers of silence is, we need scarcely mention, the most insanitary of all.

CHAPTER V.

SANITARY CONDITIONS OF TOWNS AND VILLAGES.

In the present day little has been done in respect to the sanitation of Indian towns and villages. Their general conditions, the circumstances, means, habits, and occupations of their inhabitants, all differ so immensely that the problem is by no means an easy one to solve. We hope, however, that gradually, and before long, much may be done for which now, unhappily, there is almost unlimited room for improvement. To amend the physical surroundings of the people, especially of the labouring and poorer class, would be an endowment to them of no small consequence. These are considerations so manifestly important that no apology is needed for the occupation of a little space.

(A.) *The Site and Soil.*—(1) The sites of

many of the Indian towns, to judge from their appearances and from authenticated and other history, indicate, no doubt, that they were originally selected from considerations of protection and safety from external attacks, and for the reason of their vicinity to water-supply; this is the case of the old ones. Where new ones have cropped up it has been chiefly in consequence of new industries coming into existence (mills, manufactories, railways, etc.), or of the establishment of new cantonments, and *suddar* civil stations; the site, of course, in these cases being decided upon and adopted on account of proximity and adaptation to the callings of the people. Very often the choice thus made is as bad a one as could possibly have been suggested; because, in many cases, one finds the cities and towns built upon sites which had been, and even still are, burial grounds. Every observant traveller must have noticed this great defect over and over again. Some of the other common defects in choice are that the site may have been the bed of a river in a former age, or perhaps at some time used for depositing sewage, rubbish, etc. (2) Then

again the soil should be dry, and be possessed of advantages which will tend to allow it to remain so. If, however, a soil be at all damp, it will be necessary to dry it. This can best be done by draining the ground, by which means the circulation and movement of sub-soil water will be facilitated; and some of the excessive moisture can in this manner be removed from the soil. All holes where water is likely to lodge, and so increase or keep up dampness, are to be filled. If there be too much vegetation, and the dampness be owing to it, some of it, especially in the case of large trees, if their roots obstruct the flow of ground-water, might with benefit be removed.

(B.) *Roads.*—Every town and village has roads of some sort, but of course the size, nature, and the number of these must necessarily depend upon the individual wants in each case. The points mentioned concerning these in the chapter on "Air" must be attended to.

(C.) *Drainage.*—This is a very important matter, and one which is sadly neglected. It is the want of effective and serviceable

drainage which gives rise to the majority of the evils attending sanitary defects in this country. It is impossible here to lay down definite rules as to the mode in which drains are to be constructed, as in each case the site, level, and surroundings are to be considered; but care needs, however, to be taken that the course given to the water is not in the direction of any source from which the inhabitants derive their supply of drinking-water.

(D.) *Dwellings.*—(1) The choice of sites for building has to be guided by the rules already shortly laid down. (2) The next point that ought to demand the attention of those concerned is to plan and carry out matters so that there will always be a free passage of air to all parts of the town or village. The direction of the prevailing wind, the width of the streets, lanes, and other spaces between houses, huts, etc., the relative height of contiguous houses, and, in fact, every circumstance which is likely to act as an obstacle to the free circulation and movement of air to all parts of the house or hut, as well as its drainage, should be carefully considered and weighed. A most common

defect, in relation to the prevailing wind, is the style of back-to-back building, so that the huts or houses receive little or no fresh air on one side. Another defective mode of design is that houses and huts conjointly, very often, are in the form of squares, with one or more entrances by gates into the town or village, and very often the ventilating means of these habitations (which, indeed, in themselves are far from satisfactory) are by the insufficient doors or windows, which generally open inside the enclosure, where there is stagnant air loaded with all sorts of impurities, best recognized by the olfactory nerves. The foregoing are not the only defects in building, for very often each individual house or hut, having its own court or yard in front enclosed by a wall, adds to the already impure state of the breathing-air. (3) A large number of houses and huts in both towns and villages are seemingly too old, rickety, and destitute of the ordinary conveniences of life. Those which are not so are badly constructed, and otherwise (in regard to some of the faults pointed out above) defective in respect of ventilation, light, accommodation

(over-crowding), cooking, bathing, and other arrangements. It will not be possible always to make the habitations, particularly of the ignorant classes, anything like an approach to being perfect, as in very many cases the people are too poor to afford more accommodation; but still, much may be done without any, or with little, additional outlay; for instance, by not building back to back, and by having the doors and windows to open in the fresh air. In the case of those very poor, small openings (valvular, to prevent rain-water from entering) made in the roof will, in a measure, meet some of the objections in ventilation, and through these the smoke from cooking will also ascend and find its way out. In the case of those better off, or well-to-do, there should be large doors and windows, placed opposite one another when practicable. By some such means the houses will be ventilated, and will admit of daylight. The latter is essential sanitarily. (4) Cattle, etc., are very often causes of contamination of both air and water when lodged in the rooms, etc., occupied by persons; and when they are not housed in the same rooms, they

are very often tied in little verandahs in front, through which the inner compartments receive their principal supply of air. Separate sheds, to leeward of the dwellings, should be provided for the housing of these animals. (5) Dampness is a not uncommon cause of unhealthiness of houses, and one which—besides being due to their being erected on moist soils, as referred to in several places, and so penetrating and rising up the walls to the ceilings, and thus making the insides of the houses damp and unhealthy—might be owing to leaky roofs and walls. Another defect in building which produces dampness is that the floor of the house is not sufficiently raised on plinths, and very frequently is even on a lower level than the general surface. To correct these defects, the remedies are obvious. In the first place the floor of the house must be elevated, at least about eighteen inches, above the ground, and then, if funds permit of its being cemented, it would be an additional aid to keeping the house both dry and clean. (6) The next important matter concerning habitations is cleanliness; for, supposing we have the above conditions more or

less satisfactory and efficient, it does not follow that, if the rooms in which persons live are not kept clean and sweet by them, they can expect to enjoy good health. The floors, walls, and even the roof, are of absorbent materials, easily and quickly taking up impurities, which, again, are imparted to the air, and also find access to drinking-water, food, etc. In this way the poisons of disease get lodged along with dirt and refuse. The people themselves must be taught habits of cleanliness, which have little to do with poverty. The practice of cow-dunging the floors is certainly objectionable, and should, when possible, be replaced by lime-washing. The walls, and even all the wood-work, if so treated, will be preferable to the ancient custom alluded to. In these matters of prevention, knowledge is power, and this knowledge it is our humane duty to convey to our fellow-creatures, who should be made clearly to understand the points above dealt with, so as not to underrate their importance or value, either from ignorance or laziness. The prime object is to supply the people with pure air, and this being so,

we have to look to the local authorities to ensure purity of that which enters, and, indeed, is able to enter, the house; while the duty of keeping it from being fouled can, of course, only rest with the occupants.

(E.) *Disposal of Dirty or Refuse Water.*—Waste water from cooking, washing persons, cattle, or clothes, etc., contains a variety of impurities (including excreta) which are prone to find access to either the source or stores of supply; for its safe disposal much care is therefore required. This is sometimes a difficult question to solve, and is not without involving expenditure. In a general way we may say, that this will very much depend upon the importance, size, and wealth of the town or village, and the advance, in other respects, it has made in sanitation.

(F.) *Excreta: and their Removal.*—Under the head of "Bathing," we have already briefly alluded to the means, by washing, of removing the excretions of the skin. Those of the lungs are referred to in the section devoted to "Air." So that here we only speak of the solid and liquid excrements, from the

bowels and kidneys, which respectively (for all ages and both sexes) may be said to average about two and a half ounces avoirdupois, and forty fluid ounces, for each person daily. These ought not to be allowed to soak into the earth, or to be deposited in or near habitations. In India, especially, as regards smaller and poorer municipalities, etc., the expense for their transport is a matter of very important consideration. The plan we would recommend in such cases is daily removal by hand, with perhaps such deodorization as each individual town or village can afford ; the least costly of all being by means of the ashes from the different houses or huts, each being made to contribute its share. In the case of the larger, more important, and advanced towns, drainage—either by the water system, which is the most effectual and best for health, but demanding considerable outlay and expense in the working of it, or by the pneumatic system of Captain Liernur, worked by a steam engine, whereby the excreta are engulfed into central sewers—might be adopted. It will be impossible to discuss here the dangers resulting from the escape of

sewer gases and their contamination of drinking-water and the breathing-air.

In the case of villages, in their existing conditions in other respects, we could hardly recommend the adoption of any of the systems of latrines. To utilize sewage, with safety, for agricultural purposes, we fear, the free population, as a rule, is not sufficiently advanced, although the plan has answered remarkably well in gaols, and more especially in the Punjab. In such cases, the safest plan is to allow the inhabitants to take to the field, in amongst vegetation and hedges, but at sufficiently long distances from their houses, and from wells, tanks, etc. The digging of cess-pits in or near the houses is certainly to be prevented, and by every endeavour discouraged.

The above, in short, are some of the more common defects and their remedial measures; but beside these others might arise from causes connected with water, air, soil, disposal of dead bodies, etc., all of which have been described under their respective heads.

CHAPTER VI.

FOOD.

IMPAIRMENT of health is very often due to causes connected with food, which may be improper, inferior, or too rich in quality, or deficient or excessive in quantity; or it may be that meals are not taken with regularity; or again, that it is bolted and imperfectly masticated. In one or more of these ways, disease, especially in children of tender years, young women, and aged persons, is likely to be induced.

(A.) *Purposes served by Food.*—Food consists (1) of substances which, by their introduction into the system, are capable of forming, or replacing, tissues, which have to perform, or have performed, their functions in the animal economy; (2) of substances which are capable of producing heat, and thereby of acting as fuel in the elaborate machinery of

the body; (3) of substances which cause mechanical action of muscles—all to a normal or healthy extent.

(B.) *Composition of Food.*—(i.) All the varieties of food contain the four essential elementary bodies of which our frames are formed:—Oxygen, nitrogen, hydrogen, and carbon. (ii.) Chemically, food obtained from the animal, alike that from the vegetable, kingdom, is composed of nearly the same identical compounds. Hence Nature's provision that food from the one kingdom should nourish bodies in the other, and *vice versâ*. (iii.) For purposes of animal economy the different groups of aliments are divided into the following categories (the name of each severally indicating the nature):—(1) Nitrogenous, which are substances containing nitrogen, in the forms of albumen, fibrine, and caseine; (2) oleaginous, containing animal and vegetable fats, or oils; (3) saccharine, containing sugar, or matters which, on oxidation, are convertible into sugar; (4) saline, which include the various animal, vegetable, or other salts; (5) aqueous, which consist of liquids, including water.

(C.) *Relative Value.*—It is scarcely necessary to state that only a few of the more common kinds of food can but very briefly be considered here. Milk is a solution, in water, of caseine, lactine (sugar), fat, and certain salts. The average total quantity of solids (in cow's milk) is in variable proportions, but as a rule it may be fixed at about 10 per cent. of its absolute weight; the specific gravity of such milk will be 1026. But, it must be remembered that even unadulterated milk will vary greatly in composition, and so in its nutritive value, according to (*a*) the age of the animal, (*b*) the age of her young one, and (*c*) the kind of food * she gets. Goat's milk is somewhat richer than cow's in solids (these being about 13 per cent.); the specific gravity is, therefore, greater (1030—1035). The peculiar smell in this is owing to hircine. Ass's milk is less rich in solids than goat's; this is due to the small

* Experiments in Germany on the milk of bitches show that its composition can be greatly altered by food: by the use of meat the fat can be increased, and by the use of fat alone the quantity of milk was observed to be diminished. In the case of the human subject with delicate offspring, this principle, if correct, may with advantage be applied.

quantity of caseine and fat, while the lactine or sugar is plenteous. The buffalo's milk is richer in all the ingredients. It is important to know how to be able to tell good milk from bad. Pour it in a long, thin, transparent glass tumbler, the narrower the better, and in this the milk should appear quite opaque, white, without any deposit (if there should be any before the milk has decomposed, it shows that chalk or starch has been added), and without any unnatural taste or smell (except in the case of goat's milk). After being boiled it should be the same in appearance. If water has been added the milk becomes less opaque, and falls in its specific gravity (which should not be less than 1024, and not above 1035). There is a special instrument, called the lactometer, for the purpose of ascertaining the specific gravity of milk.

Butter, which is the fat of milk, contains about 90 per cent. of its weight of fat, and, therefore, of all the articles of diet this can supply the greatest amount of this substance. An ounce taken daily will be a sufficient quantity for an adult male in fair physical

work. It is an easily digestible* substance, provided it be not rancid, in which case it produces indigestion. It contains a little albumen, which is from the caseine. The colour, taste, and smell of butter, are important points to attend to, and these are what most people are more or less practically familiar with.

Cheese is the richest kind of food we have, containing a very large quantity of nitrogenous matter (caseine) in relation to its bulk (nearly one-third); it also contains a large amount of fat, and a fair amount of salt, its water being about one-third of its absolute bulk. Being so composed, it possesses virtues by which it can best maintain the vital powers during great exertion; but unfortunately in this country it does not keep well.

Meat contains a large amount of nitrogenous matter combined with fat and certain salts which are very useful to the animal economy; but unfortunately it has no hydrocarbons, and therefore it comes to be necessary to combine these latter. It is more

* In certain forms of habitual constipation an increase in the amount of butter produces the desirable laxative effect.

easily digestible than any kind of vegetable food there is.

Nearly three-fourths of the bulk consists of water (some of which is lost in cooking), leaving about one-fourth of solids: of this about three-fifths is nitrogenous matter, and of the remaining two-fifths the greater part is fat, with a fair amount of salt. Meat on being cooked loses water, salt, and fat in relation to bulk, but gains in albumen (or nitrogenous matter).

In order to be able to tell the quality of meat, it is necessary to see it soon after the animal has been slaughtered, and this in warm weather should not be later than twelve hours. The quantity of bone the meat contains is a very important point, especially for the poor, who may look more to bulk. In lean animals, especially those in the dry season, taking the whole animal, the ratio of bone is great; but on an average about 30 per cent. of the entire weight may be allowed, on the outside. In order that a given bulk of meat be most nutritious, it should be sufficiently, but not too, fat; it should be firm to the feel, healthy-looking, but not too yellow; in

the young the flesh, however, is paler, while in the old it is darker coloured; if there is a deep purple tint it shows that, probably, the animal has not been slaughtered, but has died from some other cause. There is a reddish juice which flows out for some hours, and this is a sign of freshness.

Egg is a very nutritious article of food; three-fourths of its bulk is water, and more than half of the remainder, or one-eighth of the entire bulk, consists of albumen, and nearly that of fat, with a small fraction of salt.

Many of the vegetables are rich in albumen, and form very nutritious articles of food; peas and oatmeal, for instance, both contain a large proportion of this. Vegetables also have a fair quantity of hydrocarbons, as a rule; in fact, nearly the whole of their solid constituents, after the exclusion of water (which forms about 90 per cent. of their bulk), consists of this, with a fair amount of salts, which are useful to the system, and a small amount of fat and albumen. Potato is an exception to many of the commoner kinds of vegetables, as cabbage, carrots, etc.; it con-

tains more of hydrocarbons, fat,* albumen, and salt, but less water. It is about the best vegetable for daily use.

As regards the relative value of equal parts of wheat and rice, it may be mentioned that the former is more than doubly the richer of the two in albumen, fats, and salts, while the latter contains slightly more of hydrocarbons.

Sugar has the largest amount of hydrocarbon, which is 96 per cent. of weight, the rest being water, with a trace of salt.

(D.) *What Human Food should be.*—Every properly-regulated diet should consist of all these. Nature, in her arrangements for the animal offspring, has provided all these ingredients in milk. (1) The good meat-eater and the good vegetarian are equally well nourished. But there is, however, some difference in the processes of absorption and assimilation in the two, which probably can elucidate why the carnivorous man, like the carnivorous beast, should be more active and capable of undergoing physical exertion to a

* In the case of those inclined to looseness of the bowels, potato is to be taken sparingly; while those of costive habits would benefit by a more liberal use.

far greater extent than the purely vegetable feeder. (2) As living in high temperatures tends to keep up the heat of the body, so there is less need for heat-generating food. In other words, the necessity for carbonaceous* food ought, *pro tanto*, to be diminished. (3) The quantity of food taken, especially in this country, should be in direct proportion to the amount of exercise. Many of the diseases, and more particularly those of the liver and bowels, are due to errors or indiscretions in diet. (4) A highly carbonaceous diet, combined with deficient exercise, are the two factors which cause obesity. (5) Besides obesity, an excessive amount of carbo-hydrates, to the exclusion of, or with nitrogenous matters, has in many cases accounted for the causation of the disease in which sugar is passed by the urine.

(E.) *Economic Dietaries.*—The most economical mode of feeding our poor population, more especially during certain crises, as of scarcity from drought, etc., is a matter which demands alike the attention of the statesman, the philanthropist, the utilitarian, and the

* (2) and (3) in heading (iii.) (B.)

scientist. The minimum quantity of food required to prevent an individual from losing weight is quite a different thing from that which would only keep him alive. In all questions of diet this is not to be lost sight of. A human being—whether man, woman, or child—may exist on a certain amount of food, but it does not necessarily follow that he or she is not starving at the same time; for starvation, like everything else, is of different degrees.

"The processes of life are capable of prolongation, as we know, under very disadvantageous circumstances. The tenacity of life is in many cases remarkable; and the constitution, if originally a good one, is not readily and quickly sapped to its foundation. The weakly infant with difficulty, however, becomes a healthy child. The weakly child is less likely to attain full and healthy development than one whose infancy and childhood have been marked by health and strength. My own observation would lead me to the conclusion that deprivation of the normal quantity of food, extending over a long period, has far greater effects, and produces more profound

disturbance of the frame, than we are accustomed to admit. And I would assert it as a truth susceptible of the widest possible clinical verification, that serious results are always likely to follow where, for any considerable time, the amount of food taken is below the proper standard. This condition is the one to which I apply the term 'chronic starvation.'

"The facts in reference to starvation, in the absolute sense of the word — cases in which no food whatever is taken for some days — are well known. Death necessarily follows the complete deprivation of food for a brief period, and the symptoms produced by absolute starvation have been frequently described."*

Dr. Graily Hewitt's observations and remarks, as quoted above, relate more to the milder forms of starvation brought about gradually and insidiously; but recent actual experience of the sad famine which afflicted the people of Southern India during 1876-77

* The annual address, on "Chronic Starvation," delivered before the Harveian Society of London, January 2nd, 1879, by Graily Hewitt, M.D., F.R.C.P., President of the Society, etc., and published, *in extenso*, in "The Lancet," 1879, vol. i., p. 39.

has taught us something in respect to the effects produced on the human body by want of food. Dr. D. D. Cunningham,* who was specially deputed to the Madras Presidency, has recently published a very interesting and valuable paper dealing with this subject; and so also has Dr. Cornish.† From the writings of these observers, who are entitled to respect, it is to be inferred that serious changes (sometimes, according to degree, irremediable) are produced in the different internal organs. Dr. Cunningham has satisfactorily established with tolerable, if not with considerable, accuracy, by actual experiments on the lower forms of life, both animal and vegetable, the reality of the different destructive effects, the results of inanition in the human subject. In order, again, that any diet should nourish the body, at least to an extent equivalent to its waste,

* "On Certain Effects of Starvation on Vegetable and Animal Tissues," by D. D. Cunningham, M.B., Special Assistant to the Sanitary Commissioner with the Government of India. ["Fourteenth Annual Report of the Sanitary Commissioner with the Government of India." Calcutta, 1878.]

† "Fourteenth Annual Report of the Sanitary Commissioner for Madras," by W. R. Cornish, F.R.C.S., Surgeon-Major. Madras, 1878.

it must consist sufficiently of substances which contain albumen, fat, hydrocarbons, salts, and water; for there is no (single) article of food which, *per se*, can be said to be *teres totus, atque rotundus;* the only one which in itself is entire and complete is milk, but of course that is altogether out of question in the text here.

(F.) *Alcohol as Food.*—It has now been clearly established, that in this country, at all events for those in health, alcohol is by no means a necessity. Indeed, we may venture to assert that, owing to peculiar customs of civilization, and, probably to a far greater extent, to the fact that the amount of injury to health which the use or, rather, abuse of this agent achieves is not properly and thoroughly understood by the public, this mistake stands fast, and is handed down from posterity to posterity. Happily, however, there are such salutary checks as duties, dues, and taxes on the importation of alcoholic stimulants, and on the sale of indigenous liquors. We would go a little further, and earnestly implore that there be much greater restrictions imposed on the latter,

owing to their adulterated and noxious qualities.

(G.) *Vegetables and Fruits.*—As in India there is a great tendency to scurvy, the more general and stable use of vegetables and fruits (of better kinds) would be of considerable benefit. Vegetable and fruit gardens might, with the greatest advantage, be multiplied and improved.

Space, however, does not permit of more extended considerations on the subject of food; for further and more useful details the reader is referred to special treatises.

CHAPTER VII.

CLOTHING.

MEDICAL men have not unfrequent opportunities of observing to what extent unsuitable or deficient clothing is a cause of sickness and fatality. Every practitioner witnesses daily the terrible mortality caused in natives from insufficient protection against cold and vicissitudes of temperature; and in them, as well as in Europeans, from scanty protection against tropical heat.

(A.) *Kinds of Heat.*—There are diverse kinds of heat that tell on health. It is to the moderation of the evils of these that our endeavours should be directed. (1) There is the extrinsic heat, direct or indirect, and produced exteriorly. (2) The intrinsic heat generated within the system and augmented by violent or even moderate exertion. (3) Thus, combined, there is a considerable

evolution of heat produced within the organism, which cannot be readily dissipated in hot weather, or in the engine rooms of steamers, etc., especially if with insufficient means of ventilation, in consequence of the high temperature of the surrounding atmosphere. Disturbance in the normal performance of vital functions is thus set up, resulting in disease.

(B.) *Recommendations for the Amelioration of Heat.*—The perils of heat may, however, be minimized by the adoption of suitable clothing. (1) *Colour.*—This has everything, almost, to do with protection from the sun's rays. White is the colour least favourable to the concentration of solar heat. (2) *Material.*—The nature and quality of the clothes themselves should be regulated. It is a common and deplorable error for people to believe that when once the head is protected, they incur no further risks. The effect of solar heat on the spine is almost quite as great as that on the head. Such materials for clothing as are bad conductors of heat should invariably be chosen. It is known that muslin and finely-woven linen, although lighter, con-

duct heat to a far greater extent, and more rapidly, than cotton, flannel, and even wool, with wider interspaces in their texture. It is clear that to the latter ought preference to be given.

The following table* illustrates the result of an experiment by Dr. Coulier, of Paris :—

	Degrees Centigrade.
Thermometer not covered in the sun	37·5
„ covered with cotton shirting.....	35·1
„ „ linen	35·6
„ „ unbleached linen.....	39·6
„ „ dark blue cloth	42·0
„ „ red cloth	42·0
„ „ little finer red cloth.....	41·4

(3) Starching, which impedes evaporation and ventilation, should, as a rule, be dropped in hot weather. (4) *Make.*—Tight fits of fashion, etc., are to be condemned and discouraged, as pressure of every description, which ought to be carefully avoided, is only an impediment to the free action of the lungs and circulation of blood. (5) The cleanliness of dress should be observed, and in the case

* For this the author is indebted to Dr. McDowall, of the Bombay Army, from whose little pamphlet, "What to Wear in India," it is taken.

of the poor the same dress may be washed whilst bathing, and worn after having been sufficiently dried and aired.

(C.) *Protection of Head.*—(1) The head, as it contains the principal centre of vitality, needs to be especially protected when exposed to direct solar heat. Head-dresses should be stringently adapted in accordance with the principles above briefly laid down with regard to colour, material, etc. (2) Care should be exercised that the eyes are sufficiently protected, as also the neck, which should be free, and no part of the clothing interfering with the circulation in any way. (3) Hats, turbans, etc., should be so constructed as to allow of ventilation and evaporation.

(D.) Many of the cases of sun-stroke may be traced to neglect of one or other of these points, and by a little attention to them the many sad consequences so often resulting might be prevented.

CHAPTER VIII.

EXERCISE.

EXERCISE and perfect health are, in a certain sense, synonymous terms, inasmuch as of the former, as of the latter, every organ in the body takes its share, either directly or indirectly. But, in a narrower and more restricted sense, exercise ordinarily signifies activity of the muscular system. It must be obvious to all that this, within proper bounds, is essential for the maintenance of health. One of the principal aids to venous circulation is muscular action, and in connection with this important influence on the circulation of the blood, we have its effects on respiration, on the production of heat, on the formation and condition of the blood, and on the various nutritive and other processes of the body. Besides its import over the body, properly-regulated exercise, when not carried

to an unlimited extent, tells favourably upon the mental powers. But, in consequence of an immense expenditure of nerve force, which it entails, physical exertion, if carried beyond certain limits, which are hard to define, whilst improving the state of health of the body, does so at the expense of the development of the brain. Practically we observe in our daily experience that individuals who pass their lives in physical labour are generally, and as a rule, incapacitated for mental work; on the other hand, those who over-exert their intellectual faculties—whilst doing this they naturally rest their organs (with, perhaps, the exception of the eyes in reading or seeing, and a hand in writing) —are generally, and as a rule, disinclined for personal activity. In the several forms of indigestion, originating in too close attention to business, or other forms of sedentary employment or habits of life, we are not acquainted with a better and easier remedy for the improvement, or prevention, of impaired appetite, than exercise, such as walking, riding, rowing, swimming, gymnastics, etc. etc. These are the forms of active

exercise. There are, however, passive forms of exercise, such as driving, of having the body shampooed, rubbed, etc. etc. It will be impossible for us in the scope of this little work to discuss in detail the beneficial or injurious effects of exercise, when moderate, or very excessive, as the case may be. Our endeavour here has been simply to give a general outline, but the reader may, with the greatest advantage, consult the printed or other testimony of those who have devoted special attention to a matter which concerns the personal well-being of all, and also of children, lunatics, and convicts, of whose health they are the guardians.

CHAPTER IX.

HILLS, UPLANDS, AND SEA-PORTS.

(A.) *Hills.*—It is a matter of ordinary experience that residence on the hills is productive of good results on health. The reason of this being, that the surroundings are in every way superior to and more favourable than those of the plains, and the reviving and bracing effects of the cool and pure mountain air soon demonstrate themselves on the important vital functions of respiration, circulation, and nutrition. In the case of those not actually sick or sorry, it largely adds to the vigour, stamina, and *gaieté de cœur;* while in the case of those of broken-down constitution, or in dejection from *tædium vitæ*, the change from the dry, parching winds, or the hot, still, stifling air, will rapidly begin to work wonders. But, of course, great care and judgment are to be exercised when it

comes to be a question whether a certain sick person, suffering from advanced bowel complaint, or lung disease, and debilitated, should be taken without delay and suddenly to the hills, especially when the change will be for wet, fog, and rain, and strong, piercing cold winds. This is a matter foreign to our purpose to enter into, but suffice it to say that in such instances the verbal advice of the attending physician is to be sought and followed.

We, after a most careful study and reference to available literature within our reach, have come to the conclusion that the principal cause of sickness in the hill-stations of India is bad water. It is on this account, it may be said, that any particular one, which seems otherwise promising, may have a large number of cases of ague and dysentery. Improve the water-supply, and the sick-list gets smaller and smaller. Although some authorities, which will be referred to, believe that the so-called "Hill-Diarrhœa" is *not* the result of drinking bad water, still the weight of actual experience (apart from theory) is decidedly against such a view. Ample and

satisfactory evidence will be found in many of the official and other reports from the pens of the different writers, expressing their opinions independently of one another.

Taking, without preoption, any one of the hill-stations, we shall find this. And for instance, we take Dhurmsalla, situated in the Kangra district of the Punjab, in east longitude 76° 20′ and north latitude 32° 13′, the highest elevation being 7,000 feet above the sea level, and which, as regards forests, is highly spoken of by Dr. Cleghorn (who is a great authority on Indian forestry): soil, we are told, is made up of sandstone and red clay; and the water-supply is, according to Dr. Dickson, "chiefly drawn from a water-course, which is supplied by a stream that rises in the granitoid rocks at the foot of a glacier in the 'Dhaoli Dhar.' Nothing could be purer than this water; and it rises at such an elevation, that pipes could be laid on to the highest land on the station, but it runs into an open reservoir, and is liable to all sorts of contamination. There are also many so-called springs."*

* "Indian Annals," 1870, No. xxvii., pp. 37, 38.

The following table will at a glance give some idea of the temperature, rainfall, and the amount of sickness of this excellent hill-station :—

Months.	Temperature.			Rainfall, in inches.	Admissions, strength 1,112.		
	Max.	Min.	Mean		Total.	Fever.	Bowel complaints.
January...	61	26	43	5·0	63	21	2
February.	70	35	52	5·5	36	9	6
March ...	70	35	52	4·5	38	16	3
April.....	76	32	54	2·7	44	19	2
May	83	60	72	2·5	30	18	1
June	86	63	74	9·5	57	42	2
July	75	63	64	36·5	68	46	2
August ...	76	63	70	40·0	112	93	3
September	78	59	68	8·0	150	140	3
October ..	81	53	67	2·0	149	140	3
November	75	44	60	·1	68	51	0
December	70	35	52	2·7			
Annual ...	75	47	60	119·0	815	595	27

"The cause of the hill-diarrhœa," wrote Dr. Parkes ("Practical Hygiene," p. 627), "was certainly, in many stations, unwholesome drinking-water;" and again (at p. 38), "The hill-diarrhœa at Dhurmsalla is produced, apparently, by suspended very fine scales of mica." It is, therefore, very clear that, by

boiling and filtering properly, the water can be freed of these, and other impurities, and thereby rendered wholesome.

From the writings of Sir Ranald Martin it would seem that atmospheric coolness and moistness combined constitute causes in themselves, which, in certain constitutions, are almost sure to produce looseness of the bowels, especially when the change to the hills has been sudden, and the difference in temperature and humidity great. "Those who have visited Simla, and some of the stations near it on the hill-ranges of the Himalayas, have very generally observed a change to a pale, colourless state of the intestinal secretions, soon after their ascent into those regions, resulting, it is presumed, from the comparative cold and damp of the mountain air. Diarrhœa is, in fact, a frequent result of this change of climate; so much so, indeed, as to have received from the British residents there the name of 'the hill trot.'"* The same inference is to be

* "Influence of Tropical Climates," by Sir James Ranald Martin, C.B., F.R.S. Second edition, 1861, p. 675. London: John Churchill.

gathered from the evidence given by this authority before the "Royal Commission on the Sanitary State of the Army in India." He then expressed precisely similar views, that hill-stations above certain elevations (6,000 to 7,000 feet) predispose to bowel complaints in consequence of the "temperature and the humidity."*

The testimony of Miss Florence Nightingale has also an interesting bearing upon hill-stations from a health point of view. Although changes and improvements, no doubt, have taken place since, still it may prove useful to know what she thought of Indian hill-stations as health-resorts. She writes: "At some hill-stations there is malarious fever; others predispose to diarrhœa. The barracks and hospitals at Kussowlie and Subathov are defective both in plan and in structure. At Mount Aboo they are 'bad barracks' built in a malarious gully, and the men return suffering from intermittent fever and from scorbutic disease, the result of want of vegetables. Will it be credited that, at one of the two

* "Report of the Commissioners; Précis of Evidence; Minutes of Evidence." London, 1863, vol. i., p. 6, etc.

hill-stations of the Madras Presidency, the privies are built on the edge of the hill, in order that the natural slope may save us all the trouble of sewerage; the lavatories the same, which are emptied by 'upsetting the tubs' down the hill; and that, at the other, with more than 900 men, the barrack square was an immense swamp, for want of drainage? Low fever from March to May, from which the men have suffered who were sent there for health, is attributed to this—as if it were a meteorological observation. This refers to Wellington, on the Neilgherries. Indeed, the Neilgherry stations, the best in India, are in great danger of being permanently injured by sanitary neglects.

"In fact, all the hill-station evidence proves is that healthy men, put under healthy conditions, will remain healthy, and *vice versâ*.

"Hill-stations, it is said, are highly favourable to troops arriving in *health* if lodged in good barracks—are unfavourable in some states of disease. Dry, spacious, well-ventilated barracks, in well-chosen positions, drained, supplied with wholesome water, and out of

the way of nuisance and malaria, have been the great want of hill-stations. And want of fresh vegetables and of pure water has produced much mischief. In the rains, the water is often loaded with 'rotten vegetable matter causing diarrhœa.'" [Is this supposed to supplement the *want* of vegetables?]*

To sum up, then, we may say that, with a proper and efficient system of drainage and conservancy, wholesome pure water, removal of rank vegetation (although not the denudation of trees, etc.), good habitations built on favourable sites, proper food and drinks, and clothing, most of the evils are capable of riddance, and then, and then only, will the hill-stations, practically, prove to be desirable *health-resorts*.

In the case of those suffering from consumption, residence on the hills (under due precautions as to selection of the season of

* "Report of the Commissioners; Précis of Evidence; Minutes of Evidence." London, 1863, vol. i., p. 365. A counterpart of Miss Nightingale's remarks on these vital questions is separately printed and published in book form, entitled "Observations on the Evidence contained in the Stational Reports submitted to her by the Royal Commission on the Sanitary State of the Army in India," by Florence Nightingale. 1863, pp. 69, 70. London: Edward Stanford.

the year, proper protection by warm flannel and other clothing) is likely to have a beneficial effect both on the digestive functions and on the lung disease, by the stimulating influence of the mountain air, in consequence of less barometric pressure. Probably, likewise, because patients suffering from lung disease can take more exercise, both active and passive, on the hills than in the plains.

(B.) *Sea Towns.*—The climate of these is moist, and, with the temperature even moderately high, the air is excessively muggy and close; but, on the whole, the temperature really is not so high as in places inland. Whatever the disadvantages may be, there is one great and decided advantage, and that is the delightful and bracing sea-breeze, with, perhaps, to some slight extent, its disinfectant property. Some of the more sanitary of sea-ports, for instance Bombay, are perhaps well adapted for invalids, especially those suffering from dysentery, fever, etc., who may be sent there from inland places for the benefit of their health. In the case of permanent residents, this good effect is not so appreciable.

TABLE SHOWING THE MEAN ANNUAL TEMPERATURE AND AVERAGE ANNUAL RAINFALL OF SOME OF THE PRINCIPAL STATIONS* IN INDIA.

	NAMES.	Mean Annual Temperature, outside in shade.	Annual Average Rainfall, in inches.	Elevation above Sea Level, in feet.
Bengal Presidency.	Calcutta	82	58	8
	Agra	87	30	557
	Darjeeling	54	132	8000
	Simla	61	61	8000
	Nynee Tal	59	83	6200
Madras Presidency.	Madras	82	50	at sea level.
	Bangalore	76	25	3000
	Ootacamond	58	60	7361
	Coonoor	66	50	5161
Bombay Presidency.	Bombay	80	80	at sea level.
	Kurrachee (Scinde)	81	5	at sea level.
	Poona	78	27	1800
	Belgaum	77	52	2260
	Mahableshwar	66	240	4700
	Aboo	71	79	4015
	Poorandhar	70	73	4200

* The hill-stations are in italics.

CHAPTER X.

CONTAGIOUS AND INFECTIOUS DISEASES; AND POISONS.

THE consideration of these, for which much is capable of being done as regards prevention,—which is better than cure,—for the sake of convenience, brevity, and clearer perceptibility, may be taken up under the following heads, viz. :—(1) Those contagious* and infectious diseases which reproduce themselves; (2) those which are engendered or aggravated by uncleanliness, living amidst filth, over-crowding, etc.; and (3) certain diseases, or morbid states, dangerous to life, caused by the transference of poisons from the secretions of certain animals.

(A.) *Modes of Propagation: and General Preventive Measures (applicable to* (1) *and* (2) *Classes).*—We propose here to mention these

* Vide Preface.

in a general way first, and then to dwell upon some points which are specially relative to some. (1) The propagation of these diseases being aided by want of ventilation, or by the impurities existing in the air in and around habitations, it is evident that the prime preventive move is in the securing of a plentiful supply of fresh air, and the removal of all sources of atmospheric contamination. The necessity for this is clear, at any rate during the prevalence of epidemic diseases, the spread of which is known and acknowledged to be favoured by an impure condition of the air. (2) As in many of these diseases the poisons attach themselves to the bodies of affected persons, their separation and isolation from the rest of the community would, indeed, be a wise step. (3) The place of removal should be as far and distinct as possible; the house or hut selected for the accommodation of the sick should contain as few things as possible. Attention to its ventilation, prevention of over-crowding and of intercommunication with the non-affected community, are the next points which demand careful supervision.

The excretions from the patients, and the linen, etc., used by them, all need effectual disinfection and disposal. (4) The poisons of several of these maladies are likely, to a greater or less extent, to infect the house and articles of furniture, bedding, food, etc., therein, and are thus disseminated from house to house, and from one town or village to another. The destruction, disinfection, and careful disposal of these, as the case may be, and according to circumstances, are important points for preventive interference. (5) Another important and not uncommon, though serious, occurrence which calls for prevention is the exposure of persons afflicted with communicable diseases in public places, such as streets, bazaars, mosques, temples, etc., and their being carried in public conveyances, such as rail, ships, carriages, carts, etc. It is astonishing to note the little heed that is, seemingly, paid to these points, the grave neglect of which is so often accountable for the dissemination and epidemicity of small-pox and cholera.

It now remains for us to describe what is to be done in regard to special diseases.

(B.) *Cholera: and Enteric (Typhoid) Fever: and their Prevention.*—(1) The views of most modern observers are in harmony that these affections spread from person to person, and from place to place, through the instrumentality of the stools and vomited matters. Having understood this fundamental principle, the most careful scrutiny must be observed and strictly enforced in respect to the disposal of these discharges. The vessels used for receiving them should contain some powerful disinfectant, such as the sulphate, or other preparation, of iron, carbolic acid (or McDougall's powder), Condy's fluid, quicklime, powdered charcoal, etc. These chemicals must be in strong and concentrated forms; and the error, if any, should be on the side of excess. After this has been done, and the discharges thoroughly disinfected, they should be buried at a site as far away as possible from habitations, public resorts, sources of water-supply, etc. (2) The clothing, if possible, should be destroyed, if not disinfected. On no account should the clothes, etc., used by the sick, or by those in attendance, be allowed to be

washed near wells, rivers, etc., whence people obtain their supplies of drinking-water. (3) Drinking-water being a most common and dangerous medium for the conveyance of the poisons of these diseases, in consequence of the excrements finding their way thereto, at times of epidemics greater attention and care should be paid to the prevention of this, and the purification of water. We would here advise the measure of adding iron, either the sulphate or, still better, the perchloride, in the proportions of from twenty to sixty grains to the gallon, whenever an epidemic is prevailing, or if there be apprehension of an outburst. And, as pointed out elsewhere,* at the very least the effect of the iron will be to free the water of its animal and vegetable impurities; and, moreover, by its tonic action invigorate the system to meet the demands that would be made upon it in case of an attack, or for the purposes of resisting it. (4) The bodies of the dead should, if possible, be disinfected with carbolic acid or lime, and speedily disposed of. (5) When cholera is prevailing,

* Paper by the Author, "The Lancet," 1876, vol. ii., p. 532, *et seq.*; and other publications.

especially in sultry weather, troops, or other bodies of men, such as gangs of prisoners in transit from one gaol to another, pilgrims, etc. etc., should not be permitted to march, *en route*, through towns and villages. To establish strict land quarantines in India would be an extremely difficult, if not altogether impossible, measure.* But should the disease make its appearance in these bodies of men, or amongst the inhabitants of the places through which they have travelled or are to travel, it would always be an excellent plan to place them under quarantine for at least a week after the occurrence of the last case. As the poison hangs about the person, hair, clothes, etc., it would be an additional precaution and safeguard if they were well washed, and, when practicable, disinfected with one or other of the agents, before being allowed to proceed onward.

(6) All attempts, unfortunately for suffering humanity, hitherto made to restrain the progress of cholera by imposing restrictions on

* Practically, the futility of all so-called quarantine measures has very properly been remarked upon by Dr. J. M. Cunningham. See "Fourteenth Annual Report, by the Sanitary Commissioner with the Government of India."

intercommunications between infected and non-infected localities, have, in the majority of instances, proved, *de facto*, to be disheartening, and much more so in regard to land quarantine. It would be easy to cite from innumerable instances which are on record; but we shall content ourselves by merely placing before the reader only a few of these, and we prefer to select them from the invaluable accumulation of evidence published a couple of years ago by Dr. Gordon on this subject. This author repeats, what others have said scores of times, that, "in cantonments its strict observance is stated to be 'simply impossible.' Further, that in no instance is there evidence that quarantine has done good. It is related that in one instance in the Punjab the people declared that they preferred the cholera to the quarantine. In 1869, it is declared to have failed entirely at the stations to which it was applied. In 1872, some stations in which no quarantine was observed escaped; at others where quarantine was applied so strictly as to interfere with commerce, it raged severely. At Roorkee quarantine was strict, yet cholera appeared for the first time in

seventeen years; Umritsur escaped without quarantine. As a principle, it is declared that the difficulty of carrying out efficient isolation is no argument against taking every practicable means to prevent communication with possibly infected individuals or masses and those that are healthy. In 1875, in Bengal, efficient measures of this nature were said to be impracticable, and that such as were applied failed to prevent the introduction of cholera. In the same year while cholera was known to be distant forty miles from Salem town, Madras Presidency, a quarantine was established in the direction from which the epidemic was considered likely to approach. The disease, however, suddenly appeared in the town!"* This is from an Indian writer, while we can multiply quotations from the writings, not only of workers in this country, but also those in Germany, and America, and in England. Concerning maritime quarantine measures, the prospects are decidedly more hopeful that they

* "Notes on the Hygiene of Cholera." By Surgeon-General C. A. Gordon, M.D., C.B., Army Medical Department, Madras. 1877, pp. 182, 183. Gautz Brothers.

invariably tend to check the spread of cholera from sea-port to inland towns, and *vice versâ*: and, therefore, it would seem advisable not to omit the stringent enforcement of this precautionary measure. That this question, as to when and to what extent the quarantine is to be applied, will always perplex the authorities, is what is to be expected. The objections against its employment are strong; it offers considerable impediments to commerce, traffic, etc., thereby causing the public inconvenience and loss, and the State diminution of revenue, and even actual expenditure for the carrying out of the quarantine. The matter certainly warrants due consideration, and the careful weighing of both sides of this momentous question in each individual case, and the determination, one way or the other, based thereon.

On the subject of the so-called sanitary *cordons*, we reproduce here the first and last paragraphs under this head in his book, and simply remark that in a chapter of less than two pages, Dr. Gordon has managed to furnish us with the results of this measure as practised in the different countries since an

early part of the current century. The following, we believe, is the quintessence of the conclusions which are to be safely drawn on this point :—

"It is laid down as a rule that the more scattered a population of a place or district is, and the sooner isolation by means of cordons is established after the occurrence of cholera, the more effectual the means will be.

"If sanitary cordons are established too close to the *foci* of the epidemic, the persons forming the cordon may be attacked, and thus themselves become the means of disseminating the disease to those whom they are intended to protect."*

(C.) *Small-pox.*—(1) For the prevention of the spread of small-pox in towns and villages, the measures described in heading (A) of this section are to be forthwith adopted. It must be borne in mind that the disease spreads rapidly, and that all preventive interference should be prompt. All clothes, etc., tainted with the infecting poison ought to be burnt, which process will at the same time destroy the latter. In the present state of our know-

* *Id.* pages 183 and 184 respectively.

ledge we would most emphatically discourage even boiling or baking in favour of burning outright. (2) All unprotected persons and children are to be removed from the infected locality, and, if practicable, vaccinated at once. (3) It must be remembered that small-pox is a disease in the scattering of which the air is an important and active factor, and therefore aërial purifiers and disinfectants may with advantage be had recourse to. The results of these, however, cannot be said to be, as yet, quite decided. In order to do this, all the doors, etc., but one, of the room or dwelling to be disinfected, are closed, and the crevices filled up or pasted over with thick paper. The gaseous disinfectants generally employed, not only for small-pox, but also for cholera and typhoid, are sulphurous and nitrous acids, and chlorine. Preference is usually given to the first-named, owing to the ease with which disinfection by it is effected, and also because of the advantage which sulphur has in being in a solid form. All that is required is to light the sulphur, in the proportion of about a quarter of a pound to every 100 cubic feet of space.

This having been done, the remaining door is closed during the fumigation, so as to shut up the room or house as completely as possible. After being left closed for about eight or twelve hours, all the doors and windows are to be thrown open. Articles of furniture, etc., in the house, together with the floors, etc., must be well scrubbed with a solution of carbolic acid. (4) The infectivity of the clothing, air, etc., may be very much lessened, if not entirely annihilated, by simply rubbing the surface of the patient's body with oil, carbolized, or impregnated with other disinfectants, as permanganate of potash, if possible. By doing this two objects are attained, viz. :—It appears, according to some authorities, to arrest the spread of the disease; besides its utility from this point of view, it undoubtedly soothes the irritation, affords considerable relief to the sufferer, and often diminishes the extent of pitting and consequent risk of disfigurement. It likewise materially deodorizes the fœtor and stench.

(D.) *Vaccination.*—It is now well established that the protective influence of vaccination against the fearful ravages of small-pox

is beyond the region of doubt. All unprejudiced observers at the present day agree that, if vaccination has once been completely and efficiently performed, and, moreover, especially after re-vaccination, there is absolute immunity from susceptibility to this dire malady.

"It is the neglect of vaccination," writes Simon, "that renders the occurrence of considerable epidemics of small-pox possible; and it is by vaccination that the spread of small-pox can most effectually be prevented or restrained." The same writer affirms that, "By vaccination in infancy, if thoroughly well performed and successful, most people are completely insured for their whole lifetime against an attack of small-pox; and in the proportionately few cases where the protection is less complete, small-pox, if it be caught, will, in consequence of the vaccination, generally be so mild a disease as not to threaten death or disfigurement. Re-vaccination once properly and successfully performed does not appear ever to require repetition." This high authority, in support of this view, instances the nurses and other servants of the Small-pox Hospital

in London, who, during a period of thirty-four years, have never been known to be affected. What better testimony can be adduced than this from the Medical Officer of the Privy Council and Local Government Board?

(1) Vaccination is performed by lymph or matter taken and transferred from human arm to arm, or obtained direct from the cow.* (2) For vaccination to be effectual,

* An interesting contribution has recently appeared in the public print from the pen of Sir Thomas Watson, dwelling, with all the weight of his great authority, upon the advantages possessed in the Belgian method of direct vaccination from the calf. The following quotation may be interesting to those to whom the original paper may not be accessible :—

"Of the protective power of the Brussels vaccinations, Dr. Warlomont cites the following conclusive evidence:

"'Among more than 10,000 children vaccinated at Brussels from 1865 to 1870, and living afterwards amidst the terrible epidemic of small-pox which alarmed everybody in 1870 and 1871, there was not known a single instance of an attack of small-pox; and the same absolute immunity from that disease was enjoyed by the far greater number of re-vaccinated persons who also lived within the sphere of the contagious epidemic.'"

And, again, Watson concludes with the following appealing words :—

"The President of the College of Physicians, Dr. Risdon Bennett, informs me that in the year 1870 he was in St. Petersburg, and saw in the Foundling Hospital of that city some rooms fitted up for vaccinating upon and from the heifer, and witnessed and admired there also the

and in order to obtain the fullest constitutional effects of the vaccine lymph, two or more vesicles (little blisters) should be produced, and one at least left intact, and allowed to run its course. Vaccination, when perfect, will show itself by a typical scar being *in situ* at each of the points inoculated, and where the characteristic vesicles or blisters had disappeared. These scars or marks last for several years, but should they disappear very soon, it is an indication that the primary vaccination has not been satisfactory, and for re-vaccination. (3) It must be remembered, however, that the impression produced in the system by the primary vaccination wears out gradually with time, and that the operation should be repeated by re-vaccination at certain intervals, say of six or seven years; at all events it is very desirable to do it again, at least at puberty. (4) For the safety of the community it is

decency and strict attention to order and cleanliness with which the whole process was conducted.

"That those better methods practised in Russia and in Belgium, which I have been endeavouring to describe, may be clearly recognized and frankly adopted in these kingdoms, is my most earnest hope and desire."—"The Nineteenth Century," No. 16, June, 1878, pp. 1,007—1,009.

essential that vaccination should be compulsory, and that parents, guardians, and others who refuse it, after having its advantages and risks (by neglect) duly explained, should be prosecuted as having committed a penal offence. (5) Legislation should also provide for the prevention of inoculation by matter from a small-pox pustule, a practice both dangerous and unnecessary, since the discovery of vaccination by Dr. Edward Jenner (May 14th, 1796).

It will be gratifying to the people of India to know that it was so early as only six years after this benevolent discovery that the fruits of Jenner's great legacy to mankind commenced to be enjoyed by them; indeed, it was the donor's special desire that it should be so, for we read, with considerable respect for the illustrious author of the article from which we quote, that this wish actually came to pass during Jenner's life-time. It gives us, therefore, much pleasure to say, in Dr. Gregory's own words, that "Great difficulties were experienced in transmitting vaccine matter to India; but that object, so ardently desired by Dr. Jenner, was at length effected through the ingenuity

and zeal of Dr. De Carro. In June, 1802, vaccine lymph, in an active state, reached Bombay from the Persian Gulf, and was thence rapidly disseminated over the continent of India."*

(E.) *Relapsing Fever, Dengue, and Plague.*—Many of the directions given under heading (A) of this section also hold good for these. Relapsing fever and plague especially are known to be propagated in ill-ventilated, over-crowded, and filthy habitations, the inmates of which are for the most part badly fed, half-starved and unwashed—in short, poverty-stricken—who breathe and re-breathe the same air saturated with a variety of noxious impurities. When plague breaks out in any part of a town or village, it is a clear indication that the laws of health are, to a very deplorable pitch, unattended to; and for its prevention, besides the removal and isolation of the sick, the local authorities should take summary and timely measures for the destruction (by burning) of the houses or huts wherein or whereto it originated or

* "The Cyclopædia of Practical Medicine," article, "Vaccination." By George Gregory. Vol. iv., p. 623.

was transferred. At the same time provision should be made for the reception and accommodation of the apparently healthy, who should be prevented from mixing with people at a distance.

(F.) *Snake-bite.*—The bites of venomous snakes are answerable for a large ratio of the mortality throughout the country. According to Sir Joseph Fayrer,* about 11,416 persons lose their lives annually in one-half of India alone. There is a special apparatus situated in the upper fangs of the snake, from which the poison enters the tissues in the act of biting. We are more especially indebted for our knowledge on this subject to the laborious investigations of Sir Joseph Fayrer, Drs. Halford, Mitchell, Shortt, Francis, and others. It is to Sir J. Fayrer and Dr. Shortt that the whole of India owes a debt of gratitude for the measures now in force for the destruction of poisonous snakes. The

* "The Lancet," 1870, vol. ii., p. 865. Those interested in snakes will find an abundance of the most valuable matter in "The Thanatophidia of India," by Sir Joseph Fayrer, M.D., K.C.S.I., Physician to the Secretary of State for India in Council. Second Edition, 1873. London: J. & A. Churchill.

popularly believed idea that the Cobra di Capello, and some other serpents, keep aloof from the, so-called, *snake-stone*, or that its application to the bitten part has any specific antidotal power, is a delusion and a snare, as has been. shown by Dr. Shortt* and Sir J. Fayrer.† The only effective measures for the prevention of snake-bite consist—(1) in the removal of all rank and putrid vegetation, stones, and other rubbish, in which snakes thrive, and which are seen often around houses, huts, etc.; (2) another precaution is that people must be impressed with the necessity of carrying a light on dark nights, and of protecting the feet and legs by shoes and thick clothes. By attending to these simple points the risks would be greatly diminished.

(G.) *Hydrophobia.*—This is a contagious disorder, inasmuch as it is the result of contact with a poison (of unknown nature) for the transmission of which the saliva is the vehicle, and which is conveyed from a rabid

* "The Lancet," 1867, vol. i., p. 516, and other contributions by the same author.

† "Indian Annals of Medical Science," 1870, No. xvii. p. 223, *et seq.*

dog, etc., in the act of biting, or even licking an abraded or raw surface; sometimes, though comparatively rarely, it is occasioned by the bite of a mad or wild cat, fox, jackal, etc. A person affected may bite and thus convey the disease to another; precautions must therefore be taken to avoid this. For its prevention, (1) all stray, mad dogs, etc. (or those suspected to be so), should immediately be destroyed, or at least prevented from going about at large. (2) Should a person be bitten, in the absence of professional aid it is advisable to cauterize, or burn with a hot iron, the part or parts bitten.

CHAPTER XI.

CHILDREN.

ALTHOUGH the general principles described in each of the preceding chapters would guide parents and guardians in the proper care and management of their responsible charges, still a few words of advice in respect to the *hygiene* of children, it is hoped, will be welcomed.

One often notices, hears, and reads concerning peculiar prejudices which are hurtful to infantile life, not infrequently existing, unfortunately, even amidst the enlightened classes in this country. The neglect, in early life, of some of the most ordinary matters which govern health, bodily and mental, in after years—in childhood, and adult life—is very often lamentable, both by the friends and by the professional man whose advice is sought to remove or mitigate what should have been prevented or avoided.

(A.) That, in respect to *food*, the infant is designed by Nature to obtain its earliest sustenance from its mother, is obviously beyond doubt; and so, likewise, it is the duty of the mother to afford the nutritive supply, both as regards quantity and quality, to her offspring. We by no means profess to urge that all mothers should undertake this duty of suckling their infants, irrespective of their own conditions and capabilities, for the sake, not only of their own health, but that of their children; what we venture to maintain is simply that every child-bearing woman should try and elevate her health to the standard which will ensure her ability to equal this natural task, without injury either to her own health or that of her child. As the growth, health, and, in fact, the life, of the child depend upon this, we hold that it is incumbent upon womankind not to shirk this maternal function. But if this cannot be, with safety, secured, then the infant must be made over to a wet-nurse, or brought up by hand. In the former case the nurse should, if possible, be young and healthy, and her child of about the same age as the infant she is to

nurse; while in the latter case the milk should be made to approach as nearly as possible to human milk*; this may be done by adding water and a little sugar, which will suffice for the first few months. Very often, owing to irregularities in feeding, the digestive functions are thrown out of order. In the case of the mother or wet-nurse, her own diet needs careful regulation, both as to quality and quantity. The feeding of the cow or other animal should also be regulated, if possible, when the milk is obtained from that source. The nursing bottles, etc., need cleanliness, as any particles of coagulated milk remaining attached thereto are likely to render the new milk sour, and so cause irritation of the stomach and bowels,

* In this connection it may be interesting to mention that good and healthy human milk (about a month after confinement) should be composed of about nine per cent. of total solids, and the rest of water. Of the former about one-third should consist of caseine, and the remaining two-thirds of fat and sugar. But, from ill-health from various causes, or from dietetic causes, this normal balance is often disturbed. In feeble states of the constitution the milk becomes so poor in caseine as to be worthless, so far as the due nutrition of the infant is concerned, while it is, at the same time, a serious drain on the maternal system. With this decrease in nitrogen, there usually is a corresponding increase in the proportion of fat and sugar—an excess which cannot be readily assimilated by the infantile digestion—causing indigestion and diarrhœa, and consequent inanition and wasting.

giving rise to vomiting and diarrhœa. The frequency with which these complaints occur, in consequence mainly of inattention to some of the points touched upon above, ought in itself to show everybody how important it is to attend to them, in order to obviate the necessity for physicking. We would take this opportunity to submit to our professional brethren the advisability in such cases of ascertaining and correcting the error rather than of prescribing drugs. The sagacity of this course is self-evident, and here we may safely entrust Nature as thoroughly competent to mend matters—if we will only allow her to do so.

(B.) The next point to which we desire to call attention is, that children, just as much as adults, if not more, require to breathe pure air. Inattention to the means of ventilation of rooms and nurseries where children live is a common and serious source of disease. It is a common enough error to suppose that by shutting up all the doors and windows, children are protected from cold, and enjoy good health. There cannot be a greater mistake. We make bold to assert, and do

so not without due consideration, that the risks incurred by excluding pure and fresh air are a hundred times greater than the comparatively trifling risks from *catching a cold*, which should not be feared under very ordinary precautions.

(C.) The clothing of infants and young children should be of suitable texture, considering that their skin is tender and liable to irritation. It should be so made as not to interfere in the least degree with the functions of respiration, circulation, and digestion, nor with the free movements of all the limbs.

(D.) Children should be kept clean, that thereby they themselves should *practically* learn habits of cleanliness. They should, when in health, be bathed every day, at least once; the different excretions should never be permitted to remain long in contact with their tender and highly vascular and active skin. The water may be tepid (*vide* chap. ii., G.) at first, but gradually the child should be made accustomed to cold water. The immersion in cold water should not be very prolonged, but we may add that children, as a rule, can bear it uncommonly well; the feeling of cold

which makes them cry out is rapidly followed by reaction, with a feeling of glow, seemingly refreshing from the fact of their smiling and showing indications of liking it, and evidently invigorating from the fact of the children gaining in weight, and not suffering from any disorders attributable to it. Even in the case of feeble children, we believe the practice of a daily plunge is likely to do good, by acting as a stimulant and tonic.

(E.) Exercise is the next important matter which requires attending to. Now, in the first few months of life, infants either sleep or cry the greater part of the time. The latter demands very careful management to control the development of irritable tempers. We think that sufficient exercise may be given, in the earliest days of life, by allowing the little one to roll freely on the bed, sofa, etc., or on the nurse's arm; it should be taken out in the open air every evening at first, and also in the mornings after the child is six months old; a drive in a carriage is an excellent thing, enabling the child to breathe the purest air. One often hears the remark that it is useless taking a

child out for a drive—that it sleeps; but we should bear in mind that respiration is an involuntary act, and that the child can breathe pure air quite as well when asleep as when awake.

(F.) As the child grows, much is dependent upon the food it gets, and much irreparable mischief is often done from regulating the diet in accordance with some preconceived ideas of what a child's diet should be, without the slightest regard to age, constitution, etc. One often sees a child eighteen months or two years old, a heavy drag upon its mother's breasts; or, the opposite of this, that it is given food before the time that Nature has endowed it with the necessary means for digestion and assimilation. Nature's indications should be regarded; she points out when the breast may be given up, and when animal food may form a portion of the diet: we allude to dentition. As soon as a mother sees that her child has teeth sufficient to aid in digesting other articles besides milk, the process of feeding may be modified by adding at first the crumb of soft bread to its milk,

and feeding by spoon. A few ounces of broth or soup may form a portion of the diet of a child from eighteen months to two years old, to which a little bread crumb may be added, as the child, under healthy conditions, will be able to masticate this for the requirements of its stomach. Then, again, the effects produced by certain articles of food, and the manner in which they are prepared, will generally teach mothers and nurses what agrees and what disagrees with the particular constitution. Under-feeding, it must be borne in mind, retards the normal growth of the child, but the opposite mistake must also be guarded against. No hard and fast rules can possibly be laid down, even if we are disposed to do so, but there is always a safe and reliable guide, that so long as the child's general health remains good, its body and mind active, the appetite natural, and there is no sign in the excretions to show that the diet is in excess, then we would impress upon mothers and nurses to abide by these signs, which tell them that the food—animal, vegetable, and in combination—is proper and good.

If the diet of a child is attended to, as also the ventilation of the rooms in which it lives, and the amount of exercisé (active or passive), then the bowels will be regular, seldom needing any medicine.

The *hygienically* moral effect of imbuing children with a knowledge of the general principles by which their health is protected is most desirable. We earnestly trust that all parents, guardians, schoolmasters and mistresses will make it their utmost concern to produce a lasting impression of these principles upon the young and expanding minds of their charges.

FINIS.

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